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METHOD AND DEVICE FOR MANUFACTURING LIQUID CRYSTAL PANEL

[Abstract]

PROBLEM TO BE SOLVED: To provide a method for manufacturing a liquid crystal panel by dropping liquid crystal, by which the liquid crystal can properly and quickly be enclosed between substrates.

SOLUTION: In the method for superposing one substrate on the other substrate 10 having dropped liquid crystal 30 after the liquid crystal 30 is dropped within a sealing frame 20 on the surface of the are substrate 10 disposed with the peripheral frame-like sealing frame 20, joining between the substrates by the sealing frame 20, and sealing the liquid crystal 3 within the sealing frame 20, the substrate 10 on which the liquid crystal 30 is dropped is heated by using a heater

42 built-in a holding board 40, etc., or the quantity of dropping of the liquid crystal 30 is changed in the outer peripheral side near the sealing frame 20 and the central side, or the substrates are temporally tacked together by temporal tacking materials.

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[Claim(s)]

[Claim 1] In a method for manufacturing the liquid crystal that injects the liquid crystal between a pair of substrates opposite with a gap and seal, the method comprising processes for: (a) heating one of the substrates in which sealing frame forming the main frame shape is arranged; (b) dropping the liquid crystal within the sealing frame in the surface of the heated substrate; and (c) overlapping said heated substrate with the other substrate which the liquid crystal has been dropped, and adjoining the substrates with a sealing frame each other and sealing the liquid crystal inside the sealing frame.

[Claim 2] The method of claim 1, wherein said process (a) for heating said one of the substrates with a holding table laid therebetween with a heating means built-in in the holding table holding

[Claim 3] In a method for manufacturing the liquid crystal that injects the liquid crystal between a pair of substrates opposite with a gap and seal, the method comprising processes for: (g) dropping the liquid crystal in the sealing frame on a surface of the one side of substrates in which the sealing frame forming the main frame shape is arranged; (h) overlapping one side of substrate on the substrate on which the liquid crystal has been dropped and junctioning and junctioning

substrates with a sealing frame each other and sealing the liquid crystal inside the sealing frame, said process (g) for reducing the dropping amount of the liquid crystal to the surroundings of the sealing frame compared to the central side.

[Claim 4] In a method for manufacturing the liquid crystal that injects the liquid crystal between a pair of substrates opposite with a gap and seal, the method comprises a process (m) for dropping the liquid crystal inside the sealing frame on the the surface of one side of the substrate in which the sealing frame forming the main frame shape and a temporary fixture material having a radiation curing property outside the sealing frame is arranged, a process (n) for overlapping one side of the substrate on the substrate which the liquid crystal has been dropped and then, substrates curing the temporary fixture material by irradiation of the radiation from the ouside of the substrate and fixing temporarily the a pair of substrates, and a process (o) for pressing the a pair of substrates fixed temporarily, junctioning the substrates each other with the sealing frame, and sealing the liquid crystal inside the sealing frame.

[Claim 5] The method of claim 4, wherein said process (m) uses a material having ultraviolet curing property as the temporary fixture material, and said process (n) irradiate the untraviolet from outside of the substrate made of a transparent material through the substrate to the temporary fixture material.

[Claim 6] The method of any one of claims 1 to 4, further comprise a process (v) for vacuum suctioning a space in which the liquid crystal is arranged, before a process for sealing the liquid crystal.

[Claim 7] The method of any one of claims 1 to 6, the dropping of the liquid crystal is that the liquid crystal in the shape of the spot that may be in line with a gap in all directions is dropped.

[Claim 8] The device of the method of claim 3 further comprising a holding table for holding one of the substrates, a dropper for dropping a liquid crystal on the surface of said substrate by arranging above the holding table, and a heating means for heating the substrates with the holding table laid therebetween by a built-in holding table.

[Claim 9] The device of the method of claim 3 further comprising a holding table for holding one of the substrates, a dropper for dropping a liquid crystal on the surface of said substrate by arranging above the holding table, and a radiation irradiating machine arranged corresponding a position of the temporary fixture material of the substrates by a built-in holding table.

[Title of the Invention]

A METHOD AND AN APPARATUS MANUFACTURING A LIQUID CRYSTAL PANEL

[Detailed Description of the Invention]

[Field of the Invention]

The invention relates to a method and an apparatus manufacturing a liquid crystal panel, and more specifically, the invention relates to the method and the apparatus manufacturing a liquid crystal panel, which is used in a various display device so that the liquid crystal is sealed between a pair of substrates.

[Description of the Prior Art]

The liquid crystal panel has a structure that the liquid crystal is sealed in a narrow gap formed between substrates made of a pair of glass, etc. To improve a quality performance of the liquid crystal panel, it is required to seal an appropriate quantity of liquid crystal uniformly in the gap of the substrate. In the sealed liquid crystal, an imbalance of thickness or foam, air gap, etc. must not remain. As the manufacturing method of these liquid crystal panels, it has been known a method that after dropping the liquid crystal on a surface of one side of a substrate, one side of other substrate is junctioned thereon. In the one side of substrate, a sealing frame in the form of a main frame is mounted so that by dropping the liquid crystal

inside this sealing frame, the liquid crystal is totally spread inside the sealing frame by a self-weight fluidity of the liquid crystal. One side of the substrate is junctioned in the surface of the sealing frame. A thickness of the sealing frame determines a thickness of the gap liquid crystal between substrates.

In the method for dropping the liquid crystal on the surface of the substrate, it is also proposed a method which receives in a decompression chamber the substrate into which liquid crystal is dropped and sucks in vacuum, such that the liquid crystal is spread quickly and uniformly. The liquid crystal is spread quickly all over the substrate by vacuum suction to avoid generating the foam and air gap.

Even with the manufacturing method of the liquid crystal panel described above, it is difficult to avoid generating the foam and air gap with the uniform thickness and to arrange the liquid crystal quickly between the substrates. Since the liquid crystal dropped on the surface of substrate is formed in round droplet shape so that this droplet is spread with action of gravity, it is required to become one film shape. Due to a viscosity of the liquid crystal, it takes many time until the droplet become the film shape or the droplet often will not become flat film shape due to a partial ruggedness. Also, during treating in subsequent operation a pair of substrates in state which the liquid crystal is placed therebetween, by deviation of the substrate or movement of the liquid crystal, a quality performance of the liquid

crystal manufactured often is deteriorated.

The object of the invention is that can practice a sealing of the liquid crystal between the substrates appropriately and quickly in the method for manufacturing the liquid crystal by dropping the liquid crystal.

[Means for Solving the Problem]

A method for manufacturing the liquid crystal related to the invention is the method for manufacturing the liquid crystal that inject the liquid crystal between a pair of substrates opposite with a gap and seal. The first method comprise a process(a) for heating one side of substrate in which sealing frame forming the main frame shape is arranged, a process(b) for dropping the liquid crystal within the sealing frame in the surface of substrate heated and a process(c) for overlapping one side of substrate on the substrate which the liquid crystal has been dropped, and junctioning substrates with a sealing frame each other and sealing the liquid crystal inside the sealing frame. The second method comprise a process(g) for dropping the liquid crystal in the sealing frame on a surface of the one side of substrates in which the sealing frame forming the main frame shape is arranged, a process(h) for overlapping one side of substrate on the substrate on which the liquid crystal has been dropped and junctioning and junctioning substrates with a sealing frame each other and sealing the liquid crystal inside the sealing frame,

said process(g) for dropping the liquid crystal reduce dropping quantity of the liquid crystal at circumference side close to the sealing frame than central side.

The third method comprise a process(m) for dropping the liquid crystal inside the sealing frame on the the surface of one side of the substrate in which the sealing frame forming the main frame shape and a temporary fixture material having a radiation curing property outside the sealing frame is arranged, a process(n) for overlapping one side of the substrate on the substrate which the liquid crystal has been dropped and then, substrates curing the temporary fixture material by irradiation of the radiation from the ouside of the substrate and fixing temporarily the a pair of substrates, and a process(o) for pressing the a pair of substrates fixed temporarily, junctioning the substrates each other with the sealing frame, and sealing the liquid crystal inside the sealing frame. These the first to the third method can be practiced independently each other or in combination with each other.

[A substrate] If the liquid crystal is sealed-in with the thin film shape so that a display image is controlled by the liquid crystal, a material and a structure used is not limited. Typically, a transparent material such as a glass and a resin is used. A flexible material can be used. A size of the substrate is established depending on a dimension of the liquid crystal panel. As a concrete dimension of the substrate, it is

used the dimension in the range of 0.5 to 1.1mm in thickness, 500 to 1000nm in length, 500 to 1000 in width. Although the substrates are formed in the form of a sphere, the substrate can be formed in the form of a square, circle and other.

[The liquid crystal] It is used the liquid crystal panel that is made up of the same material as that of the typical liquid crystal panel. Due to a viscosity of the liquid crystal, there is a difference in character such as a dimension of the droplet being dropped or a diffusion after the liquid crystal is dropped on the substrate. The viscosity can be adjusted by heating the liquid crystal. The viscosity of the liquid crystal is adjusted by heating the substrate dropping the liquid crystal. The foam contained in the liquid crystal can be removed by the heating. More specifically, the viscosity of the liquid crystal dropped on the substrate can be established at 10 to 30 cP. The liquid crystal is heated with a temperature of about 30 to 100°C.

[The sealing frame] The sealing frame is arranged on the surface of the one side of the substrate of a pair of substrates. The liquid crystal is sealed-in in a space enclosed by the sealing frame. The sealing frame establishs a gap of the substrate of a pair of substrates, and at the same time junctions between the substrates. A material and a structure of the sealing frame is same in the case of the typical liquid crystal. As a material of a concrete sealing frame, epoxy resin can be used. A height of the sealing frame is established depending on a thickness of

the gap liquid crystal of the substrate. Concretely, a range of 0.003 to 0.01 mm can be adopted.

A width of the sealing frame is established to be possible to practice reliably a holding of the substrate gap and a junction between the substrates. Concretely, the width is established to be in a range of 0.5 to 1.5mm with the substrates junctioned. The sealing frame can be arranged depending on a circumference of the substrate in somewhat inside than a outer frame of the substrate. Typically, a outer shape of the sealing frame is thus established to have a smaller dimention than and a similar shape to, a outer shape of the substrate. However, the outer shape of the substrate can be different from the outer shape of the sealing frame.

[A drop of a liquid crystal] If it is intended to drop the liquid crystal on the surface of the substrate, a means for dropping the liquid crystal is adopted in a manufacturing technique of a typical liquid crystal.

For example, it is used dropper that comprises a tank for storing the liquid crystal, a pump for sending the liquid crystal and a drop nozzle for discharge the liquid crystal, etc. Only a single drop nozzle can be provided, and also a plurality of drop nozzles can be spread so that the liquid crystal may be dropped on a plurality of portions. As a liquid crystal being dropped, a droplet of a spot shape can be formed by dropping naturally a liquid crystal of a tear drop shape from the drop

nozzle on the substrate. If the liquid crystal is continuously dropped while moving the drop nozzle, a continuous filament or a discoutinuous filament of the liquid crystal can be formed in the surface of the substrate.

The liquid crystal dropped on the surface of the substrate is arranged by spreading a number of droplets of the spot shape with a gap in all directions. The droplet can be arranged at a lattice type with the same gap in all directions, and can be loosed more or less in all directions so that it may be arranged at zigzag type. A pitch gap in all directions can be changed by a position. The pitch gap of the droplet of the spot shape can be established to a degree of 5 to 20 mm. If the continuous filament or the discoutinuous filament is formed, a line can be spread to parallel with a gap, a continuous line can be bent so that it may be spread with a bending shape. Also, it can be arranged with a spiral shape.

A drop quantity of the liquid crystal is adjusted depending on a volume of a space for receiving the liquid crystal that is surrounded by a pair of substrates and a sealing range, and establishes a total quantity of the liquid crystal supplied in the entire substrate. A somewhat much liquid crystal than the volume of the space for receiving the liquid crystal is supplied, the remaining liquid crystal can be removed. A separate droplet being dropped or a quantity of liquid crystal of the filament can be established to a quantity that divides a total quantity of liquid crystal of the entire

substrate by a plurality of droplets or the filament. In the case of the droplet of the spot shape, a drop quantity can be established by considering the workability of a drop working or the diffusion after drop, etc. More specifically, a drop quantity of one droplet can be established to degree of 0.0001 to 0.01 cm^3.

If the liquid crystal is dropped on the surface of the substrate, due to the action of gravity, the liquid crystal is totally spread inside the sealing frame so that a totally uniform liquid crystal layer is constructed.

[A junction of a substrate] After the liquid crystal is dropped on the substrate provided with the sealing frame, by overlapping another substrate on the sealing frame, a pair of substrates is integrated so that the liquid crystal is sealed-in therebetween. Overlapping the substrate can be practiced after holding the substrate for a certain time, until one liquid crystal layer is formed inside the sealing frame. Concrete means for overlapping and junctioning the substrate, i.e. junctioning means can be same in the case of the typical liquid crystal.

A spacer particle can be sized on the other side of the substrate overlapped.

[A press between substrates] By pressing between substrates in thickness direction, the sealing frame can be exactly adhered closely to the substrate to be firmly junctioned. Also, it is possible to prevent that a gap ramains between substrates or an imbalance and error is generated in the gap of the substrate. If it is

intended to press between substrates, a typical press device is used. Although a press pressure is different depending on a size or a structure of the substrate, it can be typically established to degree of 0.5 to 2.0 kg/cm^2.

[a vacuum suction] By sucking in vacuum a space including the liquid crystal supplied on the substrate using a decompression chamber, etc., an air resulting in a foam or gap included in the liquid crystal can be removed. A structure and working process of the decompression chamber and the vacuum suction device can be same technique as that for manufacturing the typical liquid crystal panel. The pressure of vacuum suction is established to degree of 0.05 to 0.3 torr.

[A holding table] In a drop working of the liquid crystal into the substrate and a junction working between substrates, the substrate can be held with the holding talbe. It is preferable that a surface of the holding table is flat and rigid in order to ensure the flatness of the substrate.

If the holding table comprises a heating means such as heater therin, the liquid crystal dropped between substates from the holding table can be heated. The heating means can arrange a circulation path of a heat medium in addition to heater, inside the heating table.

[A temporary fixture] By temporary fixing a pair of substrates which the liquid crystal is therebetween, in a working step until junctioning the substrates by the

sealing frame, for example, a pressing process and a vacuum sucking process, etc., it is possible to prevent the substrates from deviating each other and the liquid crystal from moving. The temporary fixture can adopt a means such as adhesive and an engagement by a heat fusion splice, metal fitting.

As the temporary means, the temporary fixture material having radiation curing property can be arranged outside the sealing frame of the substrate which the sealing frame is mounted. By dropping the liquid crystal on the substrate, overlapping one side of the substrate and then, curing the temporary fixture material by irradiation of the radiation from the ouside of the substrate a pair of substrates is temporarily fixed. It is sufficient that a shape of the temporary fixture can fix in order not to deviate one substrate from another and also is relatively small. Also, to be able to temporarily fix an entire substrate, the temporary fixture material can be mounted at an opposite side, a diagonal position and four corner of the substrate. A height of the temporary fixture material can be established to be equal to or higher than that of the sealing frame.

An ultraviolet curing property resin can be used as the temporary fixture material having an ultraviolet curing property. If it is intended to irradiate the radiation on the temporary fixture material from outside of the substrate, the irradiation path which reachs the temporary fixture material from the substrates is

constructed to be able to transmit the radiation. If the radiation is ultraviolet, it is possible to tramsit easily the substrate made of a transparent material. If the holding talbe holding the substrat comprises a irradiation means such as a radiation irradiater therin, the radiation can be irradiated from a surface engaging the holding table with the substrate through the substrate to the temporaryh fixture material.

[Embodiment of the Invention]

[A heating of the substrate]

An embodiment of method that practices the heating of the substrate is shown in Fig. 1 to Fig. 4. As shown in Fig. 1, a substrate 10 made of a transparent material such as a glass is arranged on a flat surface of a holding table 40 that is made of material with good electric heat property. Since a heater 42 is mounted in the holding table 40, the entire holding talbe 40 can be heated. As shown in Fig. 2, in a surface of the substrate 10 is a sealing frame 20 that forms a main frame shape of a sphere at a position of somewhat inside than outer circumference. The sealing frame 20 is made of resin.

Since a dropper 34 is arranged above the holding table 40, the liquid crystal 30 is dropped on the substrate 10 from a drop nozzle 32 mounted below the dropper 34. In the dropper 34, is mounted the drop nozzle 32 at a plurality of portion with a gap in length direction on a lower surface of the dropper and a

crossing beam in width direction. Thus, the liquid crystal 30 is dropped simultaneously on a plurality of portion in the width direction, in a space of inner side than the sealing frame 20 on the surface of the substrate 10. The liquid crystal 30 being dropped from the drop nozzle 32 tends to become sphere by self- surface tension, and it becomes a tear drop shape similar to sphere so that it is dropped in the surface of the substrate 10. In the surface of the substrate 10, the liquid crystal of a tear drop shape is deformed, and a droplet of a spot shape that has a mountain form risen in the form of a plane circle dome is formed.

The dropper 34 drop the liquid crystal 30 every certain gap, while moving above the substrate 10 in the length direction. As a result, in the surface of the substrate 10, a number of droplet 36 is arranged with a gap in all directions in state been in line. Since the droplet 36 arranged on the surface of the substrate 10 is spread in horizontal direction by action of gravity so that an adjacent droplet 36 is connected each other, a layer of same thickness is formed. In this time, since the substrate 10 is heated by the holding table, the droplet 36 formed on the surface of the substrate 10 is heated so that a viscosity of the liquid crystal 30 falls and a fluidity rises. As a result, the droplet 36 is spread quickly along the surface of the substrate 10 and at the same time, a difference of thickness by a position is removed so that the liquid crystal with flat surface is easily formed.

If a layer of the liquid crystal 30 is formed inside the sealing frame 20 with certain thikness on the surface of the substrate 10, heat 42 stop an operation, a heating of the holding table 40 and the substrate 10 is ended. If the heating is ended, the liquid crystal 30 is cooled until it becomes a normal temperature. If the liquid crystal 30 is cooled, the viscosity rises so that the fluidity falls. With a subsequent process, although the liquid crystal 30 that has become a layer of certain thickness is shaken or inclined, it is possible to prevent the ruggedness and deformation from being generated in the surface of the liquid crystal 30. The end of the heating can be after any process such as a overlapping of the substrate, a vacuum suction, a pressing described below. As shown in Fig. 3, within the sealing frame, another substrate is overlapped on the substrate 10 which the liquid crystal 30 is supplied. Since a flat surface of the substrate 12 is overlapped on the layer of the flat liquid crystal which a thickness is uniform, it is possible to prevent that a foam remain or a inclinded gap is generated, between the substrate 12 and the layer of the liquid crystal 30.

As shown in Fig. 4, if another substrate 12 is arranged in a decompression chamber 50 with the substrate 10 which the liquid crystal 30 is supplied, and an air is discharged in vacuum from a vacuum suction inlet 52 of the decompression chamber 50, it is possible to suck and remove a foam contained in the liquid crystal 30 and air resulting in a gap. If the substrates 10, 12 are juncioned in a

decompression state, the air can not enter the liquid crystal 30 between the substrates 10, 12. As a result, in a space surrounded by the sealing frame 20 between the substrate 10, 12, the liquid crystal 30 becomes a state filled without the gap. Simultaneously with this vacuum suction process, or with the previous process or the next process, by pressing the substrates 10, 12 in the thickness direction, the foam and the gap that remain between the substrates 10, 12 can be reliably removed. Also, by adherring the substrates 10, 12 closely to each other with the sealing frame 20, the gap of the substrates 10, 12 can be precisely established to a predetermined dimension.

Subsequently, by curring the sealing frame 20, a liquid crystal panel which the liquid crystal 30 is sealed is fabricated within the sealing frame 20, between a pair of substrates 10, 12.

[A control of dropping volume]

While embodiment shown in Fig. 5 is same in a basic device and an operating process as the above embodiment, it is different from the above embodiment in that a dropping volume of the liquid crystal supplied on the surface of the substrate is different depending on positions. It is same in the above embodiment that a droplet 36a, 36b is supplied with a gap in all direcions within the sealing frame on the surface of the substrate 10. However, the droplet 36a of the

most outer portion adjacent to inner circumference of the sealing frame 20 is diminished in the dropping volume per one portion, compared to the droplet 36b arranged in center portion. More specifically, the dropping volume of the droplet 36a is established to about 1/2 to 1/4, compared to that of the droplet 36b. Both of plane diameter and height of droplet 36a are lower than that of the droplet 36b.

If another substrate 12 is overlapped in such state on the substrate 10 which the liquid crystal 30 is supplied and then, the substrates 10, 12 is pressed each other in the thickness direction, and the sealing frame is inserted therbetween and then, the substrate 10, 12 is adhered closelhy to each other, it is difficult that difference in thickness between a outer circumference portion close to the sealing fream 20 and center portion is generated, and it is easy that a layer of the liquid crystal 30 that has appropriate and uniform thickness over all surface is formed. The reason is as below. If the substrates 10, 12 is pressed with the sealing frame laid therebetween, a thickness of the layer of the liquid crystal 30 tends to be thick at outer circumference portion and to be thin at center portion, since it is difficult that the sealing frame 20 more rigid than the liquid crystal 30 is deformed at an adjacent outer circumference porion, compared to the center portion which only the liquid crystal 30 is being.

Since in the above embodiment, the droplet 36a of the outer circumference

portion is small and the thickness in the outer circumference portion of the layer of the liquid crystal 30 tends to be thin so that it is offset with an influence by said pressing, in the liquid crystal panel fabricated finally, it is difficult that a difference in thickness is generated on the layer of the liquid crystal 30 in the outer circumference portion and the center portion of the substrates 10, 12. Also, to differ dropping quantity of the droplet 36a from dropping quantity of the droplet 36b, it is required only that quantity of the liquid crystal 30 dropped from the drop nozzle 32 to dropper 34 is controlled. As a concrete control method, in case that uses a dropper 34 which a plurality of the drop nozzle 32 shown in Fig. 2 have been in line, by arranging the dropper 34 along inner portion of the sealing frame 20, and dropping the liquid crystal 30 in state which a dropping quantity is adjusted to be little, the drop of the small droplet 36a can be practiced. By changing the arrangement of the dropper 34 along a long side and short side of the sealing frame, the droplet 36a can be supplied at inner portion of the four side of the sealing frame. For a large droplet 36b in the center portion, while the dropper 34 is adjusted to increase a dropping quantity, and is crossed in width direction of the substrate 10, and is moved in length direction, the dropping operation can be practiced.

Also, as alternative method, while the dropper 34 that is arranged crossed in the width direction of the substrate 10 is moved in length direction, dropping

quantity is controlled in each drop nozzle 32 of dropper 34, the droplet 36a of dininished dropping quantity can be supplied when the drop nozzle 32 is arranged on the outer circumference portion close to the sealing frame 20, the droplet 36b of increased dropping quantity can be supplied when the drop nozzle 32 is arranged on the center portion far from the sealing frame 20.

[A temporary fixture]

While an embodiment shown in Fig. 6 and 7 practice a same opration using basicall same device as the above embodiment, it is different from the above embodiments in that it practice the temporary fixture.

As shown in Fig. 6, a pair of upper and lower holding tables 40, 44 holding the substrates 10, 12 is received in a pair of upper and lower decompression chamber half body 54, 56 forming the decompression chamber 50, respectly. The lower holding table 40 is received in the decompression chamber half body 56 as equipment for movement of a horizontal direction, and the substrate 10 is mounted on surface thereof. The upper holding table 44 is supported by a pressing machine 60 arranged through the decompression chamber half body 54. The upper holding table can be operated to rise and fall with the decompression chamber half body 54, and at the same time, can be operated to rise and fall by the pressing machine 60, separately from the decompression chamber half body.

The lower holding table comprises a UV irradiating machine 70 at four corners 40 therein, a irratiating path 72 made of a material of property transmitting a through-hole is mounted to reach to the surface, above the UV irradiating machine 70. A mounting position of the UV irradiating machine 70 is established to fit to a position which the temporary fixture material 74 of the substrate 10 described below is formed. As shown in detail in Fig. 7, within the substrate 10 loaded on the holding table 40, the the temporary fixture material 74 is arranged at four corners of the substrate 10, at outer side of the sealing frame 20. The temporary fixture material 74 is made of resin of a radiation curing property, and has almost same height as that of the sealing frame 20.

This embodiment is same in the above embodiment in that above this substrate 10, the liquid crystal 30 is dropped and the droplet 36 is formed within the sealing frame 20. As shown in Fig. 6(a), the substrate 10 in which the droplet 36 is formed is loaded on the lower holding table 40, and is arranged below the upper holding table 44 holding substrate 12. As shown in Fig. 6(b), by sinking the upper holding table 44, the substrate 12 is engaged with the sealing frame 20 and the temporary fixture material 74. In this state, if the lower holding table 40 is moved in a horizontal direction, a position adjustment of the substrate 10 with the substrate 12 in the horizontal direction can be practiced.

By closing the upper and lower decompression chamber half body 54, 56, the decompression chamber of a closed space is formed. By sucking in vacuum and decompressing an inner air of the decompression chamber 50 from the vacuum suction inlet 52, an air of the foam and gap remaining between substrates 10, 12 is efficiently extracted so that the liquid crystal may be filled in inner space of the sealing frame 20 between 10, 12. In a step in which the position decision of substrates 10, 12 is ended, if the ultraviolet is irradiated from the UV irradiating machine 70, the untraviolet is irradiated from the irratiating path 72 through the transparent substrate 10 to the temporary fixture material 74. UV resin of the temporary fixture material 74 to which the untravolet is irradiated is cured, the substrate 10 is junctioned with the substrate 12.

After the junction of the substrate 10, 12 by the temporary fixture material 74 is ended, by operating the pressing machine 60 and sinking the upper holding table 44, the substrate 12 is pressed against the substrate 10. Because of this, the substrate 12 is pressed strongly against the sealing frame of the substrate. The foam and gap remaining between substrates 10, 12 is reliably removed. The remaining liquid crystal is discharged outside the sealing frame 20. Subsequently, by curing the sealing frame 20 and perfectly junctioning the substrates 10, 12, the liquid crystal panel which the liquid crystal 30 is sealed-in within the sealing frame 20 between the substrates 10, 12 is completed. The tempoaray fixture of the

substrates 10, 12 by the temporary fixture material 74 can be practiced after a position adjustement between the substrates 10, 12 in horizontal direction, at the same time, before and before the sucking process, or at the same time, before and after the pressing process. It is sufficient that the temporary fixture is practiced before the operating process that a position diffenence of the substrate 10, 12 can be generated.

[Effect of the Invention]

A method for manufacuring liquid crystal panel according to the invention is a method for dropping the liquid crystal on the substrate and then, sealing-in it, wherein, by heating the substrate on which the liquid crystal dropped, decreasing quantity of liquid crystal near the sealing frame, compared to center portion, temporarily fixing the upper and lower substrates and then, pressing these, the liquid crystal is arranged uniformly and quickly with appropriate quantity, without the foam and gap between the substrates. As a result, it is possible to improve efficiency of a manufacturing work of the liquid crystal and quality performance of the liquid crystal.

[Description of Drawings]

Fig. 1 illustrates a cross-section drawing showing the embodiment of the invention and showing a dropping process of a liquid crystal.

Fig. 2 illustrates a prospective drawing of embodiment of the invention.

Fig. 3 illustates a cross-section drawing of the liquid crystal junctioned.

Fig. 4 illustates a cross-section drawing of a vacuum sucking process.

Fig. 5 illustates (a) a plan drawing and (b) a cross-section drawing of the substrate on which the liquid crystal, which shows another embodiment of the invention.

Fig. 6 illustates a cross-section drawing showing processes in step way, which shows another embodiment of the invention.

Fig. 7 illustates a plan drawing of the substrate.

[Meaning of numerical symbols in the drawings]

10, 12 substrate 20 sealing frame

30 liquid crystal

32 drop nozzle 34 dropper 40 holding

table

42 heater	50 decompression chamber
52 vacuum suction inlet	60 pressing machine
70 UV irradiating machine	74 temporary fixture material

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